High Resolution Adjustable Mirror Control for X-ray Astronomy

Completed Technology Project (2017 - 2020)

Project Introduction

We propose to build and test thin film transistor control circuitry for a new high-resolution adjustable X-ray mirror technology. This control circuitry will greatly simplify the wiring scheme to address individual actuator cells. The result will be a transformative improvement for the X-ray Surveyor mission concept: mathematical models, which fit the experimental data quite well, indicate that 0.5 arcsecond imaging is feasible through this technique utilizing thin slumped glass substrates with uncorrected angular resolution of order 5-10 arcseconds. In order to correct for figures errors in a telescope with several square meters of collecting area, millions of actuator cells must be set and held at specific voltages. It is clearly not feasible to do this via millions of wires, each one connected to an actuator. Instead, we propose to develop and test thin-film technology that operates on the same principle as megapixel computer screens. We will develop the technologies needed to build thin film piezoelectric actuators, controlled by thin film ZnO transistors, on flexible polyimide films, and to connect those films to the back surfaces of X-ray mirrors on thin glass substrates without deforming the surface. These technologies represent a promising avenue of the development of mirrors for the X-Ray Surveyor mission concept. Such a telescope will make possible detailed studies of a wide variety of astrophysical sources. One example is the Warm-Hot Intergalactic Medium (WHIM), which is thought to account for a large fraction of the normal matter in the universe but which has not been detected unambiguously to date. Another is the growth of supermassive black holes in the early universe. This proposal supports NASA's goals of technical advancement of technologies suitable for future missions, and training of graduate students.

Primary U.S. Work Locations and Key Partners

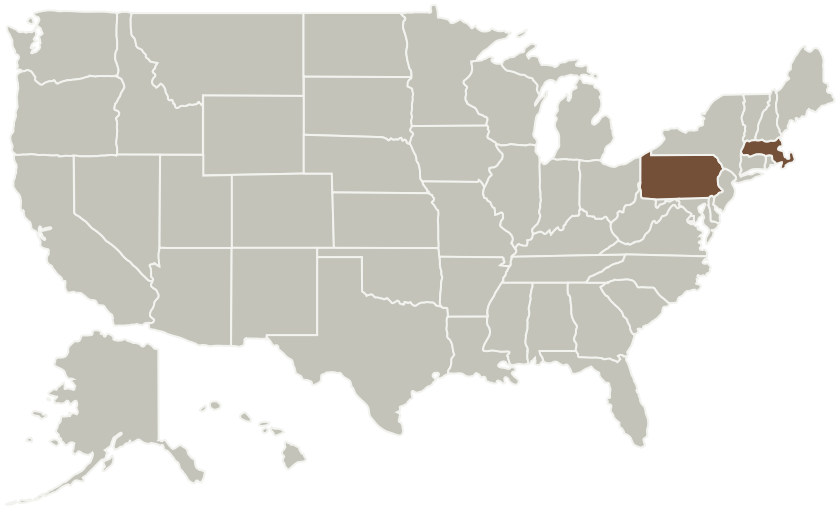

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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	2
Target Destination	3

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Astrophysics Research and Analysis

Astrophysics Research And Analysis

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Primary U.S. Work Locations	
Massachusetts	Pennsylvania

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

Principal Investigator:

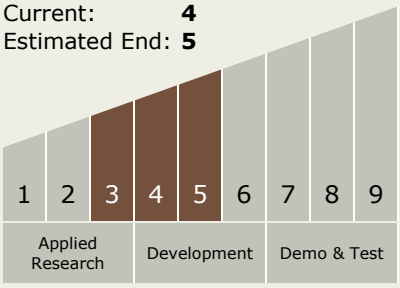
Susan Trolier-mckinstry

Co-Investigators:

Paul Reid
David N Burrows
Thomas N Jackson
Allison Eisenhower

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems

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Target Destination

Outside the Solar System